

On two of these *clichés* it has been remarked that the colours seen by transmission are very plainly complementary to those that are seen by reflection.

The theory shows that the complex colours that adorn natural objects ought to be photographed just the same as the simple colours of a spectrum. There was no necessity to verify the fact experimentally. The four *clichés* that I have the honour of submitting to the Academy represent faithfully some objects sufficiently diverse, a stained glass window of four colours, red, green, blue, yellow; a group of draperies; a plate of oranges, surmounted by a red poppy; a many-coloured parrot. These showed that the shape is represented simultaneously with the colours.

The draperies and the bird required from five to ten minutes' exposure to the electric light or the sun. The other objects were obtained after many hours of exposure to a diffuse light. The green of the foliage, the grey of the stone of a building, are perfectly produced on another *cliché*; the blue of the sky, on the contrary, was represented as indigo. It remains, then, to perfect the orthochromatism of the plate, and to increase considerably its sensibility.

NOTES.

THE Royal Society's *soirée* is being held as we go to press. We hope to give next week some account of the principal objects exhibited.

THE Bureau des Longitudes is sending an expedition to Senegambia to observe the total solar eclipse of April 1893.

THE first session of the Institution of Mining and Metallurgy is to be held in the theatre of the Geological Museum, Jermyn Street, on Wednesday, May 18, when the President, Mr. George Seymour, will deliver the inaugural address. There will be an inaugural supper at the Criterion.

AT the Royal Academy dinner Sir John Lubbock responded for science. He said that no class derived more benefit and enjoyment from works of art than men of science. Sir John referred also to the growing importance of art in relation to the material prosperity of the country. Our merchants and manufacturers, he said, could no longer rely entirely on excellence of material and solidity of workmanship, but had to look to artistic charm and beauty of design.

AT the annual meeting of the Royal Institution on May 2, the following gentlemen were elected officers for the ensuing year: the Duke of Northumberland, President; Sir James Crichton-Browne, Treasurer; Sir Frederick Bramwell, Secretary.

It is reported from Melbourne that Sir Thomas Elder has decided not to send out another exploring expedition into Central Australia at present. He attributes the failure of his recent expedition, under Mr. Lindsay, to the severity of the season, the drought having been unusually trying.

ON May 7 the members of the Geologists' Association will make an excursion to Walthamstow, Mr. J. Walter Gregory acting as director. The object of the excursionists will be to examine sections on the Tottenham and Forest Gate Railway. The best section is about half a mile from St. James's Street, and shows the lower terraces of the Lea Valley gravels resting on a very eroded surface of London Clay. Masses of the London Clay stand up, which were probably once islets. The alterations in the position of the bed of the Lea are well shown by this cutting.

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ON Tuesday next (May 10) Mr. Frederick E. Ives will begin a course of two lectures at the Royal Institution on photography in the colours of nature.

AT the meeting of the Franklin Institute, Philadelphia, on March 16, Mr. John Carbutt made some remarks on the results achieved by Mr. Frederick E. Ives in the field of colour photography, which, in his judgment, so far as practical results were concerned, were far in advance of anything that had as yet been accomplished elsewhere. Mr. Carbutt urged that it was eminently fitting for the Institute to recognize the value of the work of one of its own members, and moved that the subject of Mr. Ives's investigations and results in the field of colour photography should be referred to the committee on science and the arts for investigation and appropriate recognition. The motion was carried.

SIR JAMES CRICHTON-BROWNE delivered the annual oration at the 118th anniversary meeting of the Medical Society of London, held on Monday evening. He chose as his subject "Sex in Education." He showed that the female brain is lighter than that of the male, not only absolutely, but relatively to the respective statures and weights of the two sexes; that the specific gravity of parts of the female brain is less than that of corresponding parts of the male brain; and that the blood supply, which in the male is directed more towards the portions which are concerned in volition, cognition, and the ideomotor processes, is in the female more directed towards portions which are mainly concerned in the discharge of sensory functions. Sir James urged the necessity of such structural differences being taken into account in the conduct of education; and, while disclaiming any intention of bringing a wholesale indictment against high schools for girls, he nevertheless held that some of their methods were capable of leading to great evils, especially when not controlled by a judicious and sympathetic mistress. He pointed out the difficulty of obtaining trustworthy information as to either the methods of many schools or their effects, more especially as the pupils themselves were often hostile to the inquiry; but he referred to one school at which he had been permitted to ascertain the facts, and in which he found that, out of 187 girls belonging to the upper and middle classes, well-fed and clad and cared for, and ranging from ten to seventeen years of age, as many as 137 complained of headaches, which in 65 instances occurred occasionally, in 48 frequently, and in 24 habitually. He cited the authority of Sir Richard Owen for the position that children have no business with headaches, and that something must be wrong in the school in which they frequently suffer from them. An account was given of the *modus operandi* of excessive brain work as a factor in the production of ill-health, and statistics were quoted to show the special liability of the female organism to disease at the period of life which the educator has seized on for his own. He attached great importance to loss of appetite, especially morning appetite, as a result of overstrain, and as one which was calculated to be itself the fruitful parent of other evils; and he strongly condemned the recent decision of the University of St. Andrews to open its classes in arts, science, and theology to women as well as to men, thus, as he declared, taking not a retrograde step, but a downhill step towards confusion and disaster. "What was decided amongst the prehistoric protozoa cannot be annulled by Act of Parliament; and the essential difference between male and female cannot be obliterated at a sweep of the pen by any *Senatus Academicus*."

THE weather during the past week has been unsettled generally, and showers of cold rain, hail, or sleet have occurred

in many districts. The day temperatures have been low, with sharp frosts at night; on April 29 the thermometer on the grass fell as low as 20° in London, and heavy snow fell at Wick. From official reports for the week ended April 30 the temperature was several degrees below the mean for the week in all districts, although the bright sunshine had exceeded the normal amount. Gales were experienced on our exposed north and west coasts, but for the most part the wind has been light. Bright aurora has again been seen at several places. On May 1 the thermometer rose to 60° or more at several inland stations, but this improvement was not maintained. The winds, which during a few days were northerly and north-westerly, again became easterly over the whole of the British Isles, with unsettled and unseasonable weather.

A SPECIAL meeting of the New England Meteorological Society was held in Boston on April 6, when the recommendation of the Council to transfer the weather service of the Society to the National Weather Bureau at Washington, with the object of forming a New England Weather Service under the direction of that Bureau, was formally ratified. The New England Weather Service will continue to gather and publish observations of temperature and rainfall, and the monthly *Bulletin* will be continued as heretofore. While that part of the Society's work, in which the greater number of persons is involved, is thus transferred to the New England Weather Service, the meetings and investigations of the Society will be continued as during the past eight years. Three meetings will be held annually, and the proceedings will be published in the *American Meteorological Journal*, while the investigations will be published in the *Annals of the Harvard College Observatory*. In the *Bulletin* for March, it is stated that it is the intention of the Weather Bureau to make a special study of thunderstorms during the coming summer. The observations are to be made in several States, from May to August inclusive.

THE Deutsche Seewarte (Hamburg) has recently issued an atlas of thirty-five charts, with introductory text, showing the physical conditions of the Indian Ocean, on a similar plan to that published for the Atlantic Ocean some years ago. The rich materials at the disposal of the Seewarte have been discussed by Dr. Köppen and others in every form that can be of use both to seamen and physicists. Several charts are devoted to the currents, temperature and specific gravity, winds and monsoons, while the magnetic elements have been specially investigated by Dr. Neumayer.

THE Indian journals received by this week's mails report that Mr. John Eliot, the Meteorological Reporter to the Government of India, has returned to Simla from Chaman and Murree, where he has been establishing new meteorological observatories.

ON Friday last Colonel J. F. Maurice, Professor of Military Art and History to the Staff College, read at the meeting of the Royal United Service Institution a most interesting paper on military geography. This he described as a science dealing with all those conditions of the surface of the world which affected armies, campaigns, and battles. He sought to show how in the case of each of the great European countries strategic methods are affected by geographical conditions.

OPINIONS are being expressed by scientific workers in India in favour of the making of systematic experiments with snake poison. The Committee for the Management of the Calcutta Zoological Gardens are constructing, from private subscriptions a snake-house with the most modern improvements, which will contain specimens of all the principal poisonous snakes in

the country. If the necessary funds were available, arrangements could be made to fit up a small laboratory in connection with the snake-house, for the purpose of conducting inquiries of all descriptions bearing upon the pathology of snake-bite and cognate subjects, and in future there would be no difficulty in arranging for the carrying out of any special experiments that might be required. It is understood that Dr. D. D. Cunningham, F.R.S., President of the Committee, would in that case be willing to take an active part in organizing and promoting such inquiries and carrying out such experiments, including the testing of the various alleged remedies for snake-bite which are from time to time brought to notice. A Calcutta paper, quoted by the *Pioneer Mail*, understands that if the Government of India will make a grant of Rs. 5000 towards this object, the Lieutenant-Governor will endeavour to meet the balance from Provincial funds.

THE well-known mycologist, Dr. Stephan Schulzer von Müggenburg, has just died at the age of ninety.

AT the coming "World's Columbian Exposition" at Chicago, it is proposed to have an exhibition of the "worst weeds" from all the States and Territories of the Union.

UNDER the editorship of Mr. E. M. Holmes a Catalogue has just been issued of the "Hannbury Herbarium" in the Museum of the Pharmaceutical Society. The collection consists of above 600 dried specimens of plants yielding products used in pharmacy, or believed to have medicinal properties, each specimen being labelled with its locality or the source whence it was obtained, and often accompanied by notes or extracts from letters of foreign correspondents. The collection was formed by the late Daniel Hannbury, F.R.S.; and, by the desire of his executors, who presented it to the Pharmaceutical Society, it is preserved in a separate room, known as the "Hannbury Room," on the premises of the Society in Bloomsbury Square.

THE second part of "Botanicon Sinicum," by Dr. Bretschneider, the learned physician to the Russian Legation in Peking, has just been issued in Shanghai in the Journal of the North China Branch of the Royal Asiatic Society. The work deals with the botany of the Chinese classics, the object being to identify as far as possible the plants mentioned in the writings of Confucius, Mencius, and the other great sages of ancient China. Dr. Bretschneider takes each name in succession, supplies all the information given by native commentators on these ancient writers, and by lexicographers; then he gives all that can be gleaned from Japanese authorities, and follows this by the identifications of European students; concluding with the results of his own study and observation. Those whom Dr. Bretschneider's labours for the past twenty-five years have taught to expect profound learning, research, and thoroughness from him will not be disappointed in this work.

AMONG the contents of the new number of the Journal of the Royal Horticultural Society are the interesting papers read at the Conference on asters and perennial sunflowers, held at Chiswick in October last. The proceedings of the Conference were opened by an address by Mr. J. G. Baker, which is now printed. In this excellent address, in which the general botanical outlines of the subject are sketched out, Mr. Baker mentions that aster as it stands at present contains 200 or 300 species, and is concentrated in the United States. Nearly all our garden Michaelmas daisies belong to the species that grow wild in the Eastern United States. There are forty species of aster in the Rocky Mountains and fifteen in California, most of which are different from the eastern species, and have not been brought into cultivation. The papers published with Mr. Baker's

address are on the genus aster, by Prof. G. L. Goodale; the Michaelmas daisy as a garden plant, by the Rev. C. W. Dod; perennial sunflowers, by Mr. D. Dewar; and the culture of sunflowers, by Mr. E. H. Jenkins.

THE "University Extension" movement has spread to the United States. We learn from the *Botanical Gazette* that Prof. J. M. Coulter, President of the University of Missouri, is lecturing to large University Extension classes in Evansville and New Albany, Indiana, and Louisville, Kentucky. Each course includes twelve lectures on the general morphology and physiology of plants.

AUSTRALIANS have had bitter experience of the mischief which rabbits are capable of doing, and now they seem likely to have trouble of a similar kind from the introduction of foxes. An Australian journal, quoted in the May number of the *Zoologist* says that foxes have already spread over a wide area, and are most destructive both to lambs and poultry. They attain greater size and strength in Australia than in England, and the mild climate is highly favourable to the increase of their numbers. "It must be very disheartening," says the writer, "to all who have stock of any kind to lose, to find themselves confronted by some new enemy introduced by thoughtless or selfish persons. If some energetic steps are not soon taken, nothing can prevent the spread of foxes over the whole continent."

MR. D. L. THORPE writes from Carlisle to the *Zoologist* that starlings in that district often reproduce the notes of the oystercatcher and curlew with wonderful accuracy. On April 3 he was surprised to hear the call of the landrail; it appeared to be the familiar "crake-crake" of that bird undoubtedly, but on further investigation he ascertained that a starling was reproducing the call-note of the rail. The bird had remembered his lesson of last summer remarkably well. Mr. Thorpe also mentions that, during severe weather in January last, a friend of his (the Rev. H. A. Macpherson) was astonished one day to hear the call-note of the common sandpiper repeated with such nicety as to completely deceive him, until the starling was detected in the act of rehearsing this summer cry.

A CAPITAL lecture on Egyptian agriculture was delivered by Prof. Robert Wallace at the meeting of the Society of Arts on April 27, and is printed in the current number of the Society's Journal. Referring to the Tewfikieh College of Agriculture, Prof. Wallace says that it was named in honour of the late Khedive (Tewfik Pasha), who took a special interest in its success. It had its origin in a desire which sprang up little more than two years ago in the Egyptian Government to develop the agricultural resources of the country by calling in the aid of science. The result has been a success far beyond the most sanguine anticipations. During the first year of its existence the College contained about 60 students, selected from about 300 applicants, and the numbers of the second, the current year, which began last October, have not fallen off. A number of the sons of large land-owners have taken advantage of the instruction offered, and it is hoped by this means to spread in all directions a knowledge of improved varieties of crop plants, improved rotations, improved implements, and improved methods, not necessarily altogether new to the country, but deserving of being more widely known.

MR. W. F. LIESCHING, writing in the new number of the *Selborne Society's Magazine* on ants in Ceylon, says he saw one day a string of ants streaming forth, evidently in search of "pastures new." He flicked away the leader, and waited to see the result. An immediate halt was made by the foremost ants, and a scene of the utmost confusion ensued. The ants from behind kept arriving at the scene of the catastrophe, and there

was soon a black crowd of ants huddling and jostling one another. Some detached themselves from the main group and took a turn round, trying to find traces of their leader. At last the tail end of the line arrived, and after brief consultation they all started off again, and a line soon began to unravel itself from the tangled mass moving back to the hole from which the whole company had so lately started on "pleasure bound or labour all intent." While Mr. Liesching was watching the return journey, a leech stung his leg. He took the creature off, and put it down in the line of march. Ants will carry off a worm, why not a leech? It was, however, most amusing to see how carefully all avoided the leech.

HENRY BRUGSCH PASHA read an interesting paper on Lake Mœris at the meeting of the Société de Géographie Khediviale on April 8. He had just returned from a visit to the neighbourhood of the supposed site of the lake, so that the subject was fresh in his mind. The *Times* has given a good abstract of the paper. M. Brugsch said there was abundant monumental evidence that at a very early period of Egyptian history there existed near the plateau of Hawara an immense basin of water, which gave its name to a whole province, the Fayûm, or "lake district." In ancient times there were forty-two divisions or nomes of Egypt, each having its own capital, local government, and *cultus*, and all more or less worshipping Osiris. From these the Fayûm was excluded. It was divided like the parent country into nomes with their governors, and save in the necropolis at Hawara was given over to the worship of Sebak, the crocodile god. It was known in the hieroglyphs as To She, the lake district, which in Coptic became P-ium, the maritime district, and survives to-day in the Arabic Fayûm. It is evident from the celebrated Fayûm papyrus, of which there are two copies, that the term Mer-uer, the great water or lake, was also applied to it; and perhaps herein lies the origin of the name "Mœris." The waters of this lake must have reached to the plateau of Hawara, the necropolis of the inhabitants of a town called Shed, on the site of which stands the modern city of Medinet-el-Fayûm. It was in ancient times a Royal residence, and contained a magnificent temple dedicated to Sebak, whose dimensions far exceeded those of the temples at Thebes. Tradition gives Amen-em-hat III. of the twelfth dynasty as the constructor of Lake Mœris, and his burial-place is the crude brick pyramid at Hawara; but fragments bearing the cartouches of Amen-em-hat I. and Usertsen II., found near Medinet, would prove it of more ancient date. Moreover, it was hardly possible that a town of such dimensions as Shed would be built at any distance from water. A canal named Hune, or Hunet, cut from the Nile, fed the lake and provided for the needs of the city; the mouth of it was called in the hieroglyphs La Hune, "the opening of the canal," a name which survives in the modern "El-Lahûn." There is an interesting allusion to this "opening of the canal" in the celebrated Stela of Piankhi, written about the eighth century B.C. M. Brugsch also suggested that Ra-pa-ro-hunet, "the temple of the mouth of the canal," might give us the derivation of the word labyrinth.

WE have received the third number of *Natural Science*, the new monthly review of scientific progress. Among the contributors are Prof. G. Henslow, Mr. G. A. Boulenger, Sir J. W. Dawson, and Prof. W. C. Williamson.

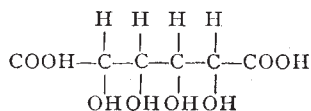
MESSRS. CHARLES GRIFFIN AND CO. have published the "Year-book of the Scientific and Learned Societies of Great Britain and Ireland." This is the ninth yearly issue. It presents lists of papers read before various Societies during the year 1891, together with information as to official changes. In most cases the Societies themselves have contributed the lists of papers. The names of those Societies concerning which no information has been received are entered in the index only.

MESSRS. W. AND A. K. JOHNSTON have issued, under the authority of the Royal Agricultural Society of England, a valuable series of eight diagrams representing the life-history of the wheat plant. The diagrams are reproductions of original drawings by Francis Bauer, now in the Botanical Department of the British Museum, and are printed in colours. With each set is sent a pamphlet by William Carruthers, F.R.S., consulting botanist to the Society, entitled "The Wheat Plant: How it Feeds and Grows." This pamphlet consists of notes explanatory of the diagrams.

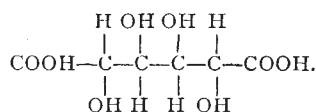
DR. L. MESCHINELLI AND DR. S. SQUINABOL announce for publication a Tertiary Flora of Italy.

FOUR lectures upon recent stellar spectroscopy and the new star in Auriga will be delivered in Gresham College, by the Rev. Edmund Ledger, at 6 p.m. on the evenings of May 10, 11, 12, and 13.

ANOTHER contribution to our knowledge of the sugars and their related compounds is published by Prof. Emil Fischer in the current number of the *Berichte*. It relates to the constitution of the group of substances at the head of which stands dulcitol, $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{CH}_2\text{OH}$, the hexahydric alcohol obtained from Madagascar manna, and prepared artificially by the reduction of milk sugar. It has already been established that the aldehyde corresponding to dulcitol is galactose, $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{COH}$, the glucose obtained from many gums, and which is formed when milk sugar is boiled with dilute acids. Moreover, it has long been known that, when either dulcitol or galactose are oxidized by means of nitric acid, a dibasic acid of the composition $\text{COOH}-(\text{CHOH})_4-(\text{COOH})$ is produced. This acid, although expressed by the same formula as saccharic acid, the acid obtained by the oxidation of common cane-sugar, differs considerably in properties from that acid, and has been termed mucic acid. It is now known to be a geometrical isomer of saccharic acid—that is to say, the two compounds only differ with regard to the relative positions of the atoms comprising their molecules. Saccharic acid, as obtained from cane-sugar, is probably unsymmetrically built up, for its solution rotates the plane of polarization of light to the left. The main result of the work now described has been to show that the molecules of mucic acid are, on the contrary, symmetrically constructed, and that its observed optical inactivity is due to this fact. Theoretical considerations, based upon the postulates of the Van 't Hoff-Wislicenus hypothesis concerning the arrangement of carbon, hydrogen, and oxygen atoms in space, lead to the view that, of the ten possible geometrically-isomeric dibasic acids of the constitution $(\text{CHOH})_4(\text{COOH})_2$, two must be optically inactive. These two optically inactive isomers would be represented respectively by the formulæ



and



One of these two was presumably mucic acid. It was evident that if the molecules possessed a configuration similar to that roughly indicated in one plane by either of the above formulæ, upon reduction to a monobasic acid there would be an equal number of chances of each of the two end carboxyl groups being attacked by the reducing agent and converted to CH_2OH groups. Consequently it was to be expected that equal quanti-

ties of two geometrically isomeric monobasic acids would be obtained, one dextro- and the other lævo-rotatory. Such has, indeed, been found by Prof. Fischer to be the case; for, upon reducing either the ethyl ester or the lactone of mucic acid (the acid itself being unattacked) by means of sodium amalgam, an optically inactive acid of the constitution $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{COOH}$ was obtained, which formed a salt with strychnine yielding two distinct kinds of crystals, resembling the well-known complementary racemates of Pasteur. From these two kinds of crystals solutions of the free acids were obtained, which were respectively dextro- and lævo-rotatory, and each was again converted into mucic acid upon oxidation. One of these, the right-handed variety, was identical with the common galactonic acid prepared by oxidation of galactose. Moreover, by further reduction of the inactive acid, an inactive glucose was obtained, from which eventually common dextro- and also lævo-galactose were isolated by fermentation; and finally, by still further reduction of the galactose, dulcitol itself was obtained. Hence, the symmetrical structure of the dulcitol group may be considered as proved, and the work also completes the artificial synthesis of these compounds; for, given the synthesis of any one by the method previously described by Prof. Fischer, any of the others may be prepared from it by the processes now described.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss Beatrice Raymond; a Wild Swine (*Sus scrofa* ♀) from Tangiers, presented by Mr. E. H. Banfater; a Great Kangaroo (*Macropus giganteus*) from Australia, presented by Mrs. Frazer; a Purple Heron (*Ardea purpurea*), European, presented by Captain Woodward; a Bateleur Eagle (*Helotarsus caudatus*), a Tawny Eagle (*Aquila naevioides*) from Africa, presented by Captain Webster; a Raven (*Corvus corax*), European, presented by Mr. F. J. Stokes; seven Common Vipers (*Vipera berus*), British, presented by Mr. T. A. Cotton, F.Z.S.; a Rufous-necked Weaver Bird (*Hyphantornis textor*) from West Africa, purchased; an English Wild Bull (*Bos taurus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS.—In the March number of the *Memorie della Società degli Spettroscopisti Italiani*, there are some interesting notes relating to spots and prominences. Prof. Tacchini gives a tabulated statement of the solar observations made at the Royal Observatory for the last three months of the year 1891. The most frequent records of faculæ occurred in the zones $\pm 10^\circ \pm 30^\circ$, only one being seen as high as the zone $+40^\circ + 50^\circ$. As regards the spots, the greatest frequency of groups took place in the zones $\pm 10^\circ \pm 20^\circ$, 23 and 10 being observed in the north and south respectively.

Profs. A. Mascari and J. Fenyi both contribute some notes on the large group of spots visible in February last, the latter pointing out that the relation of the eruption to the large group was such that its centre was situated very near the side of the great nucleus of the south spot, but was entirely outside the spot itself.

M. H. Deslandres records also his observations with respect to the remarkable protuberance visible on March 3 at about 10 a.m. From spectroscopic observations he obtained a radial velocity of 200 kilometres per second, using the hydrogen and helium lines. He also obtained a photograph of the invisible ultra-violet region, which furnished him with "an exact image" of this protuberance. The H and K lines were extraordinarily brilliant, and the negative contained the entire series of ultra-violet rays of hydrogen. It may be mentioned that at the appearance of this large protuberance no special indication was registered on the curves of the magnetic instruments which M. Deslandres obtained from M. Wolf.

Prof. Tacchini communicated to the Paris Academy on April 25 the results of solar observations made at the Roman College during the first three months of this year. Spots and